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Circular of Information 15.

August, 1927.

THE OREGON FRUIT WASHER

by

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The fruit washer described here was designed and constructed with the aim of satisfying the present need for a simple and inexpensive washing machine. The washer in some respects is patterned after the so-called borax bath tank, introduced into the orange industry by the Bureau of Plant Industry of the United States Department of Agriculture. It is the understanding of the Oregon Experiment Station that the essential features of the machine are already covered by public service patent and that any one may use it without interfering with the patent rights of others.

Principle of the Machine

As shown by the illustrations, the machine consists of a two-compartment tank, one compartment for the acid bath, and another for the fresh water bath. The fruit is propelled through these tanks by means of submergers or paddle wheels. It is lifted out of the tanks by elevators or large paddle wheels, which rotate in the same direction as the submergers. Both the elevators and the submergers should rotate at a speed of not more than four revolutions per minute. The mechanism can be driven either by a one-half horse power motor or by a one and one-half horse power gasoline engine. No attempt has been made to construct a drying unit for this washer. The fruit can be dried naturally or it can be dried with one of the commercial drying devices now offered for sale by some of the manufacturers.

Construction.

The machine is of simple construction and in many cases can be built entirely by the grower himself. It is made almost entirely of wood. This is desirable since hydrochloric acid is very destructive to most metal. In the construction of the acid unit all tie rods should be on the outside. All bolts should be imbedded in the wood so that they do not come in direct contact with the acid. All nails

should be countersunk and the heads should be covered with such materials as bees-wax, grafting wax, coal tar or paraffin. The tanks should be painted with linseed oil or varnish. Lead paint is destroyed by the action of the acid and should not be used. Ducco and lacquer are fairly satisfactory. All metal parts such as sprocket wheels and sprocket chain should be painted with asphalt paint. The linoleum guards should be painted with varnish or asphalt paint.

Construction of Elevators.

The elevators used to remove the fruit from the tanks are paddle wheels 26 inches in diameter. A guard made of common linoleum and supported by curved pieces of wood guides the fruit into the wheel. These elevators handle the fruit very efficiently and are not difficult to construct. It is essential, however, that the wheels be of the right size and that the linoleum guards be properly adjusted. Elevators of this type were selected after trying out many devices for lifting the fruit from the tanks.

Towel Wipers.

The towel wipers in the acid compartment serve several purposes and add to the efficiency of the machine. First, they hold the fruit and prevent it from going through too rapidly. Second, they turn the fruit as it passes beneath them, and third, they deposit acid solution on the dry side of the fruit. These wipers consist merely of cotton toweling, cut in shreds and draped across the braces of the tank so that the shredded ends dip from one to two inches in the solution. The toweling is held in place by a piece of board laid over the braces. As shown by the illustrations, two of these wipers are used in each space between the submersers in the acid tank.

Driving Mechanism.

The machine can be driven either by means of sprocket wheels and sprocket chain, or by belts and pulleys. The speed of the motor or gas engine can be reduced by means of chains and belts and pulleys of various sizes. The reduction device can be purchased as standard equipment or it can be made up from second hand material obtained from spray pumps or other pieces of machinery.

Cost of the Machine.

No attempt has been made to ascertain the exact cost of the machine, it being apparent that the cost will vary according to the amount of material already on hand and the amount of labor that must be hired.

Capacity.

The towel wipers in the acid unit hold back the fruit so that no fruit comes out until the entire surface is covered and until an excess amount of fruit has been fed into the machine.

The speed at which the fruit travels through the machine, then, is governed by the amount of fruit that is fed into it rather than by the speed of the submergers and paddle wheels. This offers an easy method of timing the washing operation. With an acid compartment 14 feet long and 3 feet, 8 inches wide, the machine holds approximately 5 packed boxes of apples at one time. Then, if the fruit is to be kept in the acid bath for five minutes the machine can be fed at the rate of about one packed box per minute or 60 packed boxes per hour. When less than five minutes of treatment are required the speed of the operation can be increased.

Operating the Machine

First, fill the acid tank with clean water, so that the apples will be completely covered as they pass under the submergers. Then add commercial hydrochloric (muriatic) acid at the rate of one gallon for every 100 gallons of water in the tank.

Next, fill the water tank with fresh water and keep fresh water flowing into this tank during the entire time the machine is in operation. A mere plunge into fresh water does not remove all the acid. The fresh water coming into the tank should be sprayed on to the fruit by means of spray nozzels. Bordeaux nozzels are satisfactory for this purpose. Where water with force is not available a submerger should be placed in the water tank so that the fruit will be completely submerged for some time. The efficiency of the rinsing can be tested by applying the tongue to the cheek and calyx of the apples as they come out of the fresh water bath. If acid is still present a biting sensation will be noted.

The machine does its best work when fed at a uniform and constant rate. It will not work well if the fruit is dumped in large quantities at a time. The feeding should be so regulated that the elevators are never jammed with fruit. Bruising is apt to occur if the fruit is crowded through the machine. To avoid difficulty from this source the machine should be made large enough so that capacity will be provided without crowding.

Amount of Treatment Necessary.

The amount of treatment necessary to thoroughly remove spray residue by the washing method is dependant upon several factors, such as the amount of spray present, the kind of spray present, the degree of maturity attained by the fruit and the variety of fruit. This being true no general recommendation can be made regarding the amount of treatment that needs to be given. Ordinarily, fruit that is visibly clean after washing will be found to be well below the tolerances. This is especially true when the fruit is treated shortly after harvest and when no oil sprays were applied during the season. In case of doubt as to the efficiency of the treatment given the fruit should be subjected to a chemical analysis.

Replenishing the Acid Bath.

As the fruit passes through the acid unit a certain amount of the washing solution will be carried away. This loss amounts to about 30 gallons for each car of fruit. This means that approximately 30 gallons of water and one third gallon of acid will have to be added to the tank for each car of fruit treated. A satisfactory way to handle this situation is to have a barrel of dilute solution near the machine and to replenish the acid tank as the level of the liquid goes down.

The acid in the tank usually does not become weaker with use. After a tank of solution has been made up, therefore, it should not be necessary to add acid to it.

Handling the Acid.

Hydrochloric acid is very destructive to metal and should be handled in either wood, glass or rubber containers. Wooden buckets are very satisfactory for handling either the concentrated or dilute solutions. The pure acid is very active and must be handled with care. It is destructive to clothing and if accidentally spilled on the hands should be washed off immediately. The fumes from the pure acid are annoying and should not be inhaled. After dilution to the proper strength for washing, however, the acid is mild and should give no trouble. It is not caustic to the hands and face at these strengths.

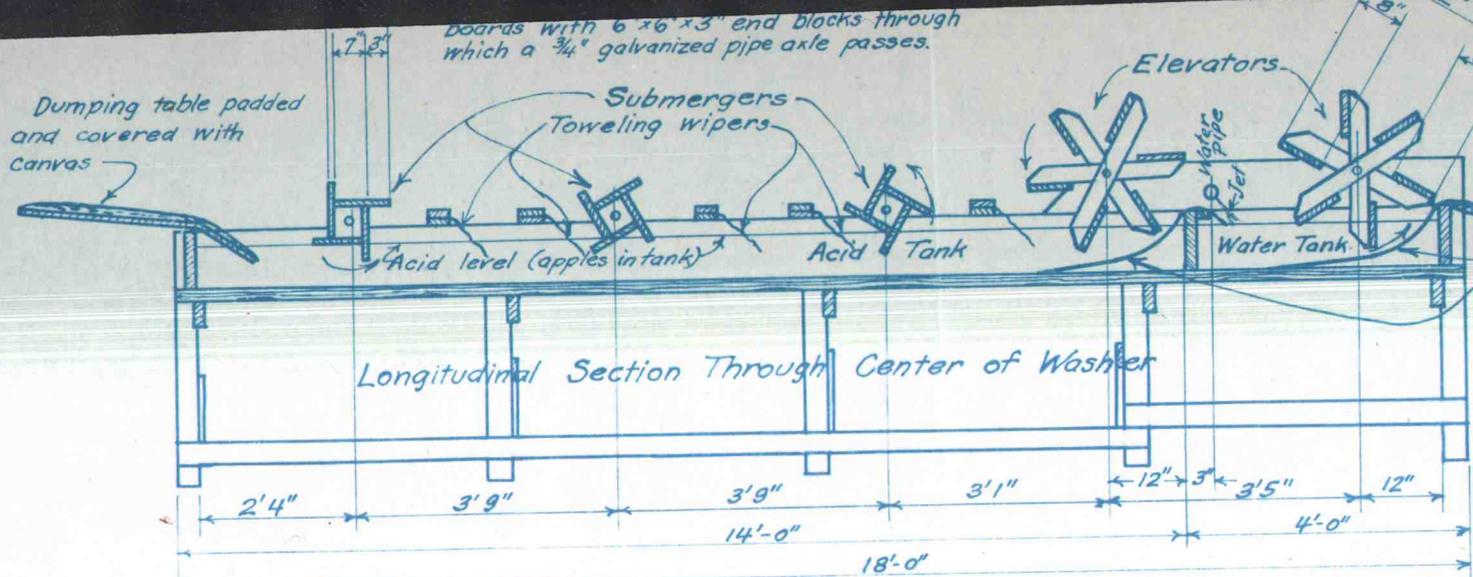
When to Wash Fruit.

Washing should be done as soon after picking as possible. At this time the residue is comparatively easy to remove. The fruit itself is firm and is less apt to be bruised by physical handling. Fruit treated immediately after harvest is usually free from decay and there is less likelihood of contaminating the acid solution with the spores of decay organisms. It is not advisable to store fruit in common storage with the idea of washing it after removal from storage. Until more is known regarding the effects of moisture at the time of packing and storing, the fruit should be dried as thoroughly as possible after washing.

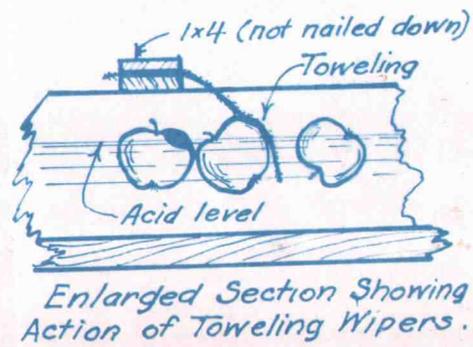
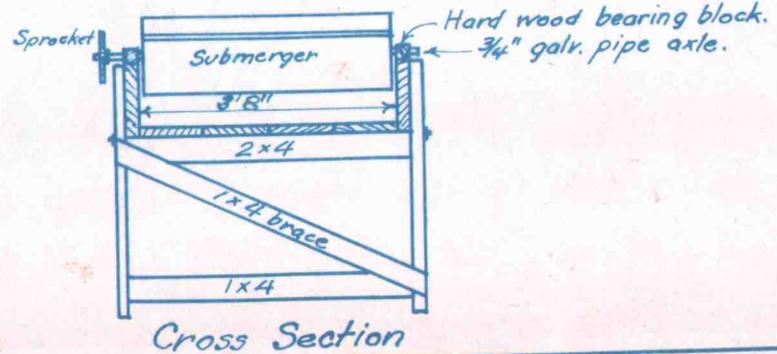
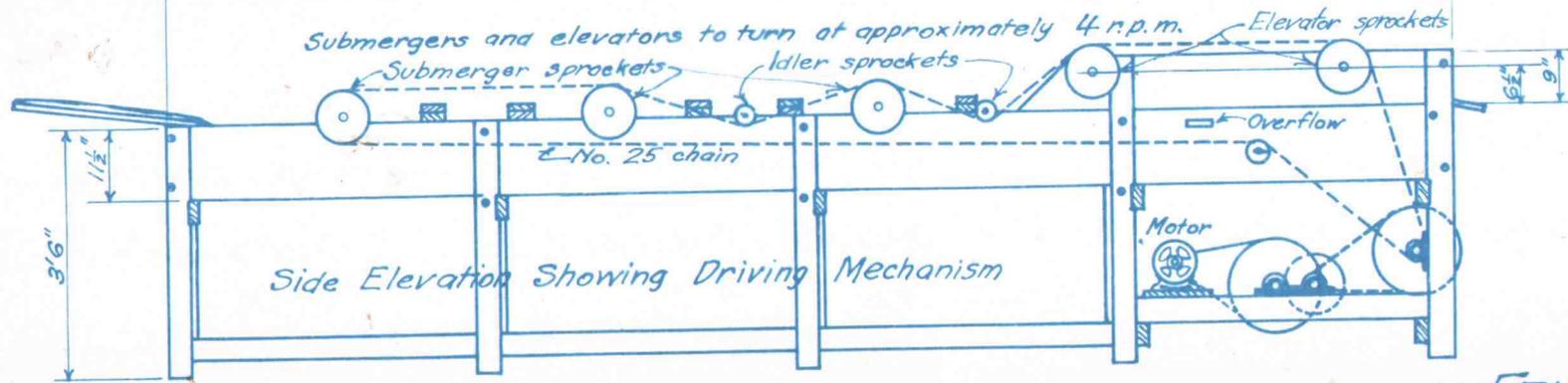
Acknowledgments.

The authors are indebted to the Cutler Manufacturing Company for materials and valuable suggestions in the construction of the machine.

Note: Anyone planning on building one of these machines in the near future should plan on visiting the Experiment Station at Corvallis and seeing the machine in operation. Much time will be saved if this is done. It is practically impossible to describe each feature so that a clear picture can be gained without actually seeing the machine.



Power required:
 1/2 h.p. electric motor, or
 1 1/2 h.p. gas engine



FRUIT WASHER
 Dimension Sheet
 to accompany
 O.A.C. STATION MIMEOGRAPHED
 CIRCULAR No. 15
 Scale 3/8" = 1" Aug. 22, 1927